

204 series



features



- Direct replacement for T1 ¾ Bi-Pin
- Flat topped for enhanced, even illumination of large lens areas
- Reduces maintenance costs
- 'Fit and Forget' reliability
- Warm white LED may be used behind coloured lens as a true replacement for a filament lamp
- Pack Quantity = 20 Pieces

specifications

Ordering information and typical characteristics (Ta = 25°C)

Part Number	Colour	Voltage Vac/dc	Current DC (mA)	Luminous Intensity (mcd)	Wave Length (nm)	Operating Temp. (°C)	Storage Temp. (°C)	De-rating Graphs
204-501-21-38	Red	12 Vdc	20	600	630	-40 - +80	-40 - +100	D
204-521-21-38	Yellow	12 Vdc	20	600	585	-40 - +80	-40 - +100	D
204-532-21-38	Green	12 Vdc	20	2300	515	-40 - +75	-40 - +100	F
204-930-21-38	Blue	12 Vdc	20	9870	465	-30 - +85	-40 - +100	U
204-993-21-38	Warm White	12 Vdc	20	850	* See pg.2	-30 - +85	-40 - +100	I
204-501-23-38	Red	24-28 Vdc	17	600	630	-40 - +80	-40 - +100	D
204-521-23-38	Yellow	24-28 Vdc	17	600	585	-40 - +80	-40 - +100	D
204-532-23-38	Green	24-28 Vdc	16	2300	515	-40 - +75	-40 - +100	F
204-997-23-38	White	24-28 Vdc	16	27000	* See pg.2	-30 - +85	-40 - +100	I
204-993-23-38	Warm White	24-28 Vdc	16	850	* See pg.2	-30 - +85	-40 - +100	I

^ = Voltage for 20mA product is Vf at 20mA, not Vopr

- Products must be de-rated according to the de-rating information. Each de-rating graph refers to specific LEDs. Please refer to graphs on page 2.

- Luminous intensity is measured at 20mA on a discrete LED unless otherwise stated.

to order

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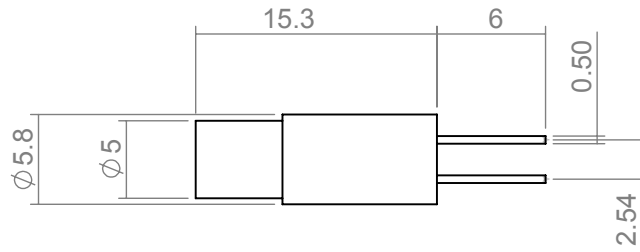
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technical data



Colour dot on product sleeve denotes LED colour.
Green dot on base indicates cathode -ve termination.

Dimensions in mm (typical)
Not to scale

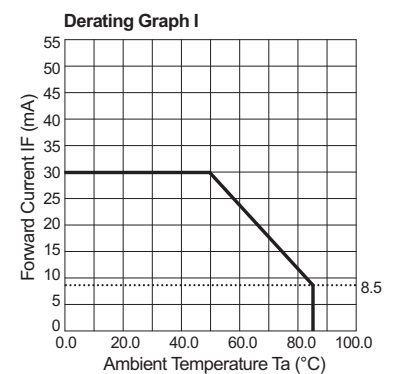
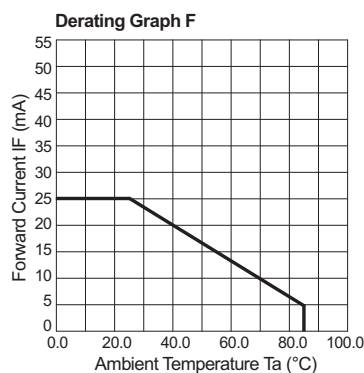
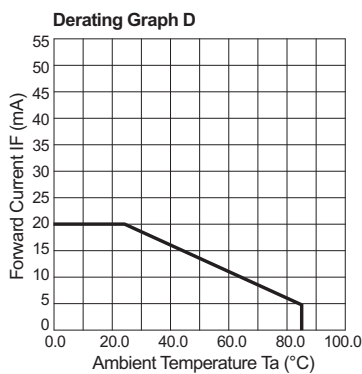
Lamp Base Style	Series	Metric Equivalent (mm)	Max. Power Dissipation (mW)
T1 ¼ Bi-Pin	204	5	500

899F	*Typical emission colour Warm White			
x	0.4255	0.4390	0.4680	0.4519
y	0.4000	0.4310	0.4385	0.4086

997F-C	*Typical emission colour White			
x	0.31	-	-	-
y	0.32	-	-	-

Intensities (Iv) and colour shades of white (x,y co-ordinates) may vary between leds within a batch

de-rating information



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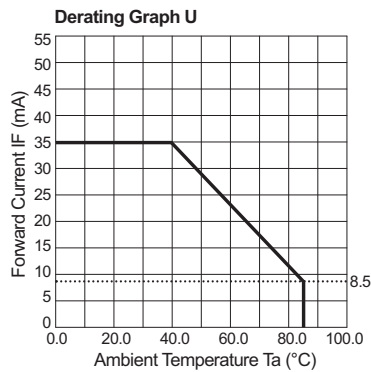
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de-rating information continued



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also available

Part numbers also available in the 204 series:

Part Number	Colour	Voltage Vopr
204-501-04-38	Red	20 mA dc
204-501-19-38	Red	3.7 Vdc
204-501-21	Red	12 Vdc
204-501-71-38	Red	12 Vac 50 Hz
204-505-22	Red	24 Vdc
204-521-21	Yellow	12 Vdc
204-532-20-38	Green	5/6 Vdc
204-532-21	Green	12 Vdc
204-532-71-38	Green	12 Vac 50 Hz
204-585-21	Yellow	12 Vdc
204-899-23-50	Warm White	28 Vdc
204-905-22	Orange	24 Vdc
204-907-23-38	Green	28 Vdc
204-930-04-38	Blue	20 mA dc
204-930-21	Blue	12 Vdc
204-930-23	Blue	28 Vdc
204-930-23-38	Blue	28 Vdc
204-993-22-38	Warm White	24 Vdc
204-993-23	Warm White	28 Vdc
204-993-24-38	Warm White	48 Vdc
204-993-48-38	Warm White	60 Vdc
204-993-71-38	Warm White	12 Vac 50 Hz
204-997-04	White	20 mA dc
204-997-22-38	White	24 Vdc

The products listed above illustrate all of the options available to order. These products may have custom modifications that alter their operation beyond the generic information contained within this datasheet. Please contact sales for further information.

RP = Reverse Polarity

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design considerations

Single-Chip LEDs

All devices feature water clear high intensity LEDs as standard. In devices where discrete LEDs are used, the single chip LED devices have been modified by the removal of the domed portion of the encapsulation (flat-topped) to provide even illumination of switches and annunciators. Non flat topped versions are also available.

Flat-topping does not apply to devices using surface-mounted device (SMD) LEDs.

Product Evaluation

Filament replacement LEDs have been specifically designed to meet the primary objective of providing improved reliability. As this product range is suitable for both new-build and retro-fit, (sometimes in very old systems), a wide range of illuminated push button switches and lamp holders can be encountered. Due to subjectivity, evaluation of the LED type is recommended, (samples of all standard models are available). Care should be taken to correctly simulate operating ambient light conditions to ensure that the correct device has been selected to maximise viewing characteristics such as viewing angle, colour compatibility and on/ off contrast ratio.

Electro-Static Discharge (ESD)

Build up of electro-static discharge occurs in many situations involving people moving and handling products. The range of possible situations is very diverse but voltage levels as high as several thousand volts can and do arise in many individual situations. When an operator charged up to these levels handles a static sensitive device, there is a very probable likelihood that the device will be irreversibly damaged. It is essential that precautions are taken at all stages during manufacture and assembly of these products. Although LEDs were never considered to be static sensitive devices, changes in manufacturing technology and materials used to produce higher intensity products over a large range of the wavelength spectrum have changed this. Marl has an approved system of ESD control from goods in, through production and into final packing and despatch. Marl recommend all users of LED based products follow the guidelines of BS 100015.

Power De-Rating

The forward voltage/ current value of an LED is dependant upon the ambient temperature of the environment in which it is operated. Therefore, care must be taken to operate the LED at the correct voltage/ current values, depending upon the ambient temperature. Consequently, a recommendation regarding operating voltages and currents is given in order to address these temperature effects. This recommendation is termed 'de-rating'. It is usual for forward voltages and currents to be specified for ambient temperature of 25°C. However, because the values of these qualities vary with temperature, marl should be contacted if the device is to be operated at a temperature significantly higher than 25°C. Marl accept no liability for any product that is operated higher than the stated voltage.

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